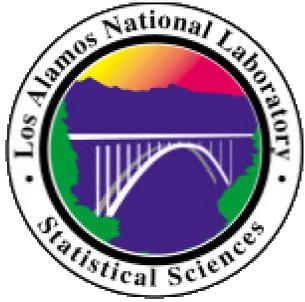


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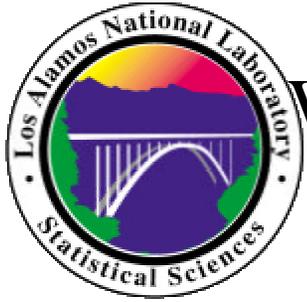
# CONCLUSIONS AND RESOURCES



# WHAT IS NEW AND UNIQUE?

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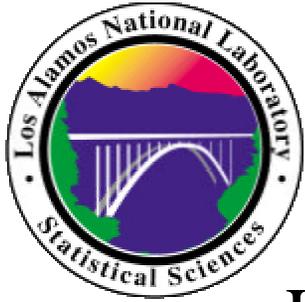
- Ability to penetrate a culture (specifically NW) and cause paradigm shifts
- Not just a model, but a process
- Expert judgment elicitation and quantification
- Processes to get at an organization's problem-solving processes
- Latest in the statistics and mathematics
- Explicit tools to develop dynamic representations (e.g., process trees, Bayes Nets, ...)
- Knowledge systems that capture the rapidly evolving R&D process



# WHY DIDN'T WE DO THIS 10 YEARS AGO?

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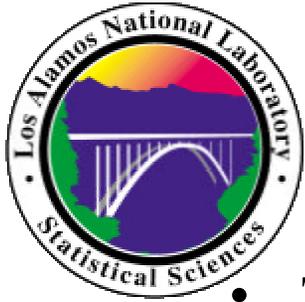
- Increased computing power
- Transparent environments
- Maturity of statistical/mathematical methods
- Breakdown of “stovepipe” communities
- Maturity of formal elicitation and analysis methods
- Cost of testing (social and dollars)



# DEVELOPMENT OF AN IIT IS A TEAM EVENT

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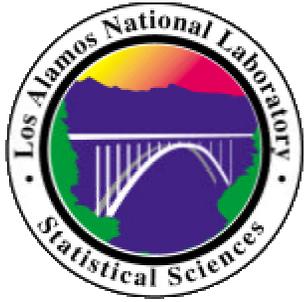
- LANL IIT team draws from
  - Statistics
  - Mathematics
  - Cultural Anthropology
  - Economics/Econometrics
  - Engineering
  - Computer/Information Science
- Application teams should consist of
  - Subject matter specialist(s) (advisor expert and experts)
  - Analyst(s) (skilled in statistics and decision analysis)
  - Social scientist(s) (skilled in elicitation and representation)
  - Software Engineer(s) (including knowledge of web applications and GUIs)



# WHY IIT WORKS

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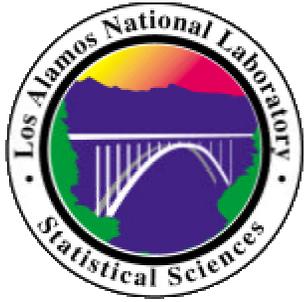
- Takes advantage of all knowledge/information/data available at any given time, including expertise and expert judgment
- Adapts terms, models, etc. to the way the customer (subject matter specialists) think about the decision metrics
- Customizes everything, from representation to analysis to the multiple communities of practice
- Recognizes the importance of formal representations of the problem structure and allowing for multiple types of representations
- Uses rigorous mathematical and statistical methods for combining information
- Uses formal methods for elicitation
- Transforms information, models, and uncertainties into probability space
- Captures and analyzes the system's multiple levels, dimensions, and dynamics
- Documents, documents, documents— knowledge system formation



# CONTROVERSIAL TRADE OFFS

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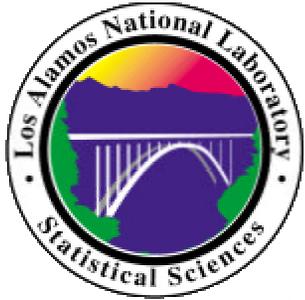
- Explicit versus implicit assumptions
- Computer models and similar system “data” versus test data
- Validity of information integration versus using full system tests as the integrator
- Time investment to change the way we solve problems versus business as usual
- Customized, collaborative solutions versus tossing the problem over the fence and waiting



# WHAT HAVE YOU LEARNED?

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- **Representations**
  - they are important and frequently overlooked
  - there are several useful formats
- **Elicitation**
  - formalism regarding how to conduct and determine mode of response
  - how to do simple quantification methods
- **Statistical Information Integration**
  - how to do *iid* methods and simple Bayesian
  - general set-up for Recursive Hierarchical Bayesian Models
- **Knowledge Systems**
  - what they are
  - why you would want one!
- **Propagation**
  - how to do simple propagation
  - can be done in a consistent manner
- **Decision Theory**
  - utility functions are a natural extension to formalize the analysis process
  - sensitivity analysis is critical



# WHAT IS NEXT?

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- It is not so easy to leave here and fill all the gaps between what you have learned and what you need to know/do to actually solve a problem using IIT.
- But, expertise is out there to help
  - Books, papers, and other courses on statistical methods, decision analysis, and elicitation methods
  - Collaborators knowledgeable in the areas of the IIT process, and the integration of these areas
  - Software and people capable of quickly implementing customized knowledge systems (e.g., Lotus Notes Applications Programmers)
- Just try it – gather, determine, combine, use, and guide!